

Seismic surveys



Vibroseis trucks send acoustic waves into the earth. A recording truck is connected to up to 10km of cable to receive the seismic signal

Seismic surveys are widely used around the world to produce a detailed image of the geology beneath the earth's surface.

Oil and gas companies use this information to accurately plan the location of wells to minimise land disturbance. QGC runs seismic surveys as part of our natural gas exploration work in central and southern Queensland. Sometimes, the surveys are on private or leasehold land.

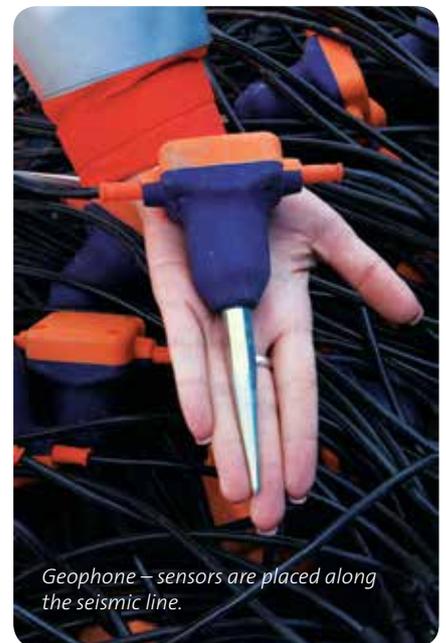
Seismic surveys are done under authorities to prospect (ATP), petroleum licences (PL) or Data Acquisition Authorities (DAA) granted by the Queensland Government, and are subject to environmental conditions.

This document provides landholders with more information about seismic surveys, in particular:

- What seismic surveys involve and why are they necessary
- What QGC does to minimise the impact of seismic surveys on landholders
- Compensation for disturbances from seismic surveys
- Contacts for more information.

Quick facts

- QGC is committed to negotiating in good faith to reach voluntary agreements with landholders so we may enter their land
- To minimise the impact on landholders, the sides of roads, power line easements and fence lines are used as much as possible
- Erosion control measures are also installed or re-established in consultation with the landholder.



Geophone – sensors are placed along the seismic line.

Liaising with landholders

QGC is committed to negotiating in good faith to reach agreements with landholders so we may enter their land.

This involves a comprehensive land liaison procedure based on integrity, fairness and respect. We work with landholders and others on the location of infrastructure as projects develop.

A key factor in deciding the most suitable location is our ability to minimise impact on individual landholders. We appoint personnel to work individually with landholders and where possible, these same people will work with the landholders throughout the land access process.

We provide landholders with information about the activities we are proposing and will seek landholder's views about the operational and commercial activities that we might affect. We offer fair and appropriate compensation for all unavoidable impacts.

We also work with environmental and cultural heritage experts on proposed exploration areas before final decisions on site selection are made.

Where properties are occupied or used by people who are not the owners, we inform, consult and reach agreement with the owners and occupiers.



Seismic theory

Oil and gas companies use seismic surveys to produce a detailed image of the geology beneath the earth's surface. Data from the surveys is used to plan well locations, allowing companies to avoid drilling unnecessary wells and helping to minimise land disturbance.

Seismic surveys have two main components.

The first component consists of special trucks, which vibrate the earth's surface to send acoustic waves into the earth. The vibration lasts eight to 12 seconds at intervals of 10 metres to 25 metres along seismic lines and is unnoticeable more than 20 metres from the truck.

The second component consists of receivers, which record a reflected signal in a central recording truck that is connected to the receivers by wires that run along the seismic line.

When QGC conducts seismic surveys on private property our land access team will first seek formal consent from landholders

What happens during a seismic survey?

The provisional location and route selection of each seismic line is initially planned using maps, satellite images and aerial photographs. It is important for data quality that the lines be as straight as possible.

The proposed route of seismic lines takes into account areas of subsurface interest and existing seismic line locations.

To minimise the impact on landholders, the sides of roads, power line easements and fence lines are used as much as possible. It is not possible to route all lines so they avoid private or leasehold land.

Scouting the survey route involves inspection by an environmental scientist for rare plants and animals, weed infestations and other environmentally sensitive areas.

Traditional custodians of the land may also check for cultural heritage sensitivities.

A surveyor records the route using satellite positioning and all relevant information about the seismic line is sent to QGC head office for processing where detailed plans of the seismic line route are compiled.

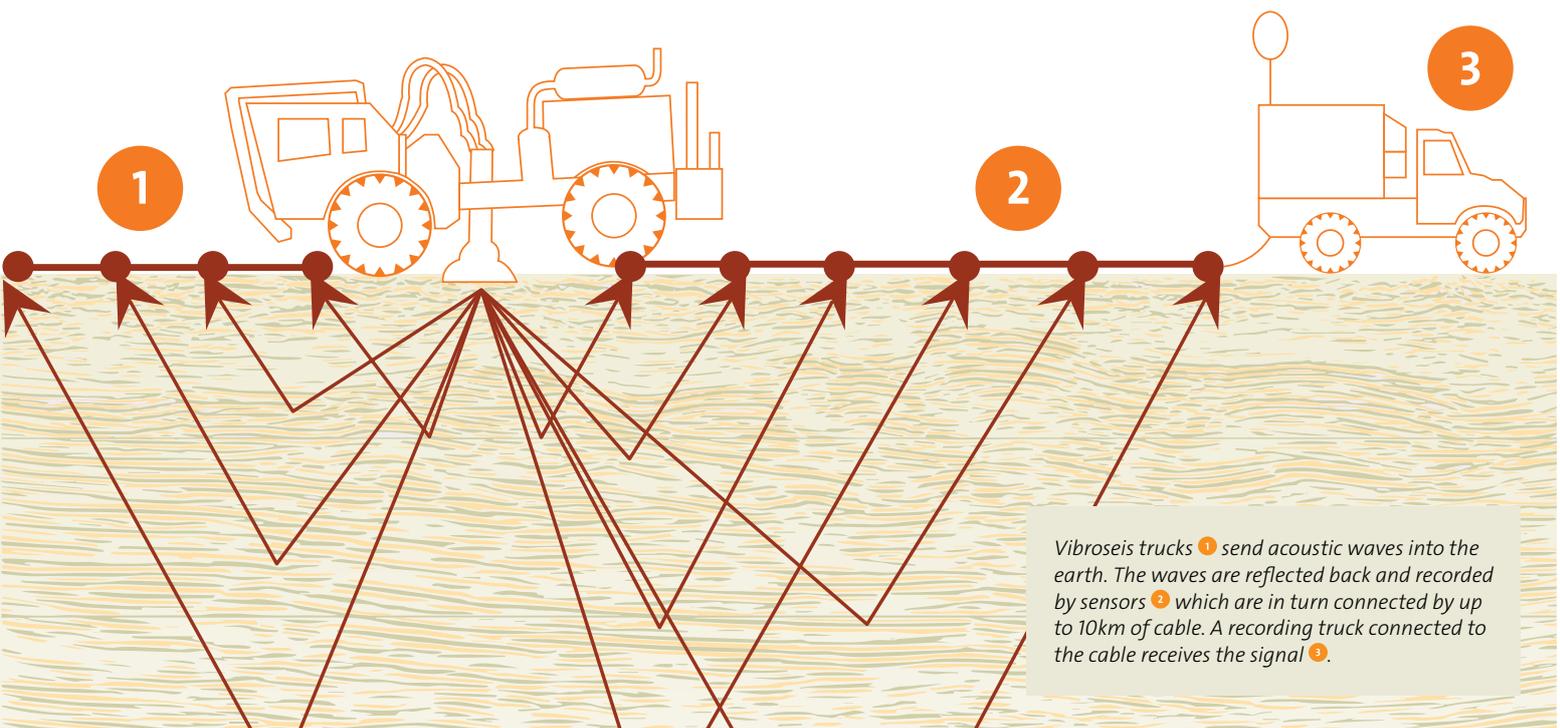
Throughout the seismic survey process, QGC's land and community team advise when activities will start and will remain the point of contact with landholders.

All seismic crews are made fully aware that they must comply with landholders' access rules while on their land.

Sometimes it is necessary for the safety of the animals and protection of the seismic cables, to muster cattle to adjacent paddocks. Wherever this is necessary, QGC works with the landholder to cover the costs.

Temporary "cookie" gates are installed in fence lines by mutual agreement to reduce the amount of vehicle movements across the land.

QGC takes weed hygiene extremely seriously and the seismic crews are equipped with two portable washdown units and one high volume static wash-down at the base camp location.



Equipment

Seismic data acquisition starts when the final route of the seismic line has been agreed and the recording equipment is deployed.

To help reduce environmental impact, seismic lines are cleared using a mulcher that can cut a path through vegetation close to the surface without damaging root systems. This allows plants to rapidly regrow and return to their original state.

The use of graders and bulldozers is kept to a minimum and as a last resort in rough terrain. QGC uses modified equipment carriers to further minimise impact on vegetation including utility vehicles with wider tyres and where necessary lighter John Deere Gator vehicles.

If sections of the seismic line are inaccessible due to excessive foliage or rough terrain, survey equipment can be carried in by hand and the vehicles, including the vibrating equipment, are driven along the easiest path, even if this means they are offset some distance from the cable line.

In some sensitive areas that the trucks with vibrating equipment cannot reach, other means may be used to generate acoustic waves. These include hand held vibrating equipment similar to that used to tamp road works. Another technique involves using small 100 gram explosives planted in covered bores one to two metres deep.

Up to 10km of seismic cable is laid out at any one time, usually deployed by a group of about 19 people.

Seismic sensors have a highly sensitive moving coil magnet encased in plastic with a 5cm metal spike that allows them to be buried just below the surface in lines 1.5 metres apart.



The strings of sensors are in turn connected to a cable that sends data to a recording truck.

The line is powered by 12 volt batteries, with a battery placed every 400m along the line.

When the seismic line crosses roads or tracks, cables are either put under rubber mats or buried to protect them from traffic. The vibroseis trucks normally work in groups of two, vibrating the ground either once or twice per vibration point. The trucks cover about 10km a day and operations are restricted to daylight hours only.

Where the seismic line passes a residence or any object that is sensitive to vibration, Peak Particle Velocity meters are deployed to ensure safe vibration levels are not exceeded.

Most landholders will have equipment on their properties for only three or four days, unless the project is suspended due to bad weather. Rain may cause work to be suspended to prevent vehicles from damaging the ground or access tracks.

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After the survey

A small number of people retrieve the equipment after the survey and load the cables, sensors and batteries into pick-up trucks for transport to the front of the line.

Restoration and rehabilitation of the area to its condition before the survey occurs after the whole crew has passed over a section of line. Any land that has been disturbed during the survey, such as paddocks that have been blade ploughed that require a single width track to be graded across them,

are re-ploughed and re-seeded. Temporary gates are removed and fence lines are restored.

Erosion control measures are also installed or re-established in consultation with the landholder. Crews check that all equipment and any accidentally discarded rubbish are removed. All temporary gates are removed and any fences or other property that might be accidentally damaged are repaired.



Peak particle velocity meters provide real-time monitoring of vibrations when data is being collected close to sensitive receptors, such as residences

About QGC

QGC is a leading Australian natural gas explorer and producer focused on developing reserves in both the Surat and Bowen basins for domestic and international supply.

Our headquarters are in Brisbane and we employ more than 3,600 people across Queensland. In 2011, QGC produced about 20% of Queensland's gas demand.

QGC is wholly owned by BG Group, a leading oil and gas company with headquarters in the United Kingdom and operations in more than 25 countries.

Our commitments

We seek to minimise the effects of our operations on landholders and make a positive contribution to the protection of the environment.

We run our business in accordance with all government regulations, industry standards and the access rules that we agree with landholders.

Our staff, contractors and consultants follow QGC's Code of Conduct, outlined in the 'Information for Landholders' booklet and available at our website: www.qgc.com.au

Contact details

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